M.SC.Semester-II Examination, 2021
(Mathematics)
PAPER: C-MTM-204
(STATISTICAL AND NUMERICAL METHODS)

## Answer any FOUR questions from the following: <br> $4 \times 10=40$

1. (a) The values of function $f(x)$ are given for certain values of $x$ :

| $x:$ | 0 | 5 | 10 | 15 | 20 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| $f(x):$ | 1.0 | 1.6 | 3.8 | 8.2 | 15.4 |

Construct the difference table and estimate the value of $f(21)$ by Newton's Backward Formula.
(b) The values of function $f(x)$ are given for certain values of $x$ :

| $x:$ | 0 | 1 | 2 | 3 |
| ---: | :---: | :--- | :--- | :--- |
| $f(x):$ | 1 | 2 | 11 | 34 |

Find $f(x)$ assuming it to be a polynomial of degree three in $x . \quad 5+5$
2. (a) Find the value of $\int_{0}^{1}\left(4 x-3 x^{2}\right) d x$ by Trapezoidal rule, taking 10 equal subintervals.
(b) Evaluate $\int_{0}^{0.6} e^{x} d x$ by Simpson's $1 / 3$ rule, taking 6 equal subintervals.

$$
5+5
$$

3. (a) If $f(x)=4-6 x+\sin ^{2} x$, find the relative percentage error in $f(x)$ for $x=0$ when error in $x$ is 0.004 .
(b) Compute $y$ (0.4), from the equation $\frac{d y}{d x}=x y, y(0)=2$, taking step length $h=0.2$, by Runge-Kutta method, correct up to four decimal places.
(c) Find the median of $33,86,68,32,80,48,70,64$.
4. (a) Solve the system of equations by Gauss-elimination method:

$$
\begin{gathered}
2 x_{1}+x_{2}+x_{3}=4 \\
x_{1}-x_{2}+2 x_{3}=2 \\
2 x_{1}+2 x_{2}-x_{3}=3
\end{gathered}
$$

(b) Solve the equation $x^{3}-9 x+1=0$ by method of bisection for the root lying between 2 and 3, correct up to 3-significant figures. $5+5$
5. (a) Describes Newton-Raphson method to find a real root of the equation $f(x)=0$, where $f(x)$ is continuous function of $x$. Write the convergence criteria of this method.
(b) Deduce the equation of regression lines for a set of $n$ bivariate data.
6. (a) Find $y(0.8)$, from the equation $\frac{d y}{d x}=-\frac{y}{1+x}, y(0.3)=2$, taking step length $h=$ 0.1, by Euler's method, correct up to four decimal places.
(b) Solve the system of equations by Crammer's rule:

$$
\begin{gathered}
x_{1}+x_{2}+x_{3}=2 \\
2 x_{1}+x_{2}-x_{3}=5
\end{gathered}
$$

$$
x_{1}+3 x_{2}+2 x_{3}=5
$$

7. The heights (cm) of 25 male and 20 female college students are presented in the following table.

| Males $\left(X_{1}\right)$ | Females $\left(X_{2}\right)$ |
| :--- | :--- |
| 163 | 164 |
| 165 | 155 |
| 170 | 160 |
| 162 | 154 |
| 160 | 160 |
| 165 | 153 |
| 170 | 159 |
| 165 | 166 |
| 164 | 163 |
| 181 | 166 |
| 169 | 163 |

$161 \quad 165$
$162 \quad 167$
$165 \quad 164$
$163 \quad 162$
$168 \quad 160$
$169 \quad 159$
$164 \quad 167$
$180 \quad 157$
$160 \quad 158$
160
167
174
168
165

Critical value: 2.017 at 0.05 level of significance
2.416 at 0.02 level of significance
2.695 at 0.01 level of significance
3.532 at 0.001 level of significance

Find if there is a significance difference between the mean heights of male and female college students using t-test.
8. Compute correlation co-efficient, regression co-efficient between the advertisement costs $(x)$ and sales $(y)$ as per data given below and also find the lines of regression.

Advertisement costs in thousand $\begin{array}{lllllllllll}39 & 65 & 62 & 90 & 82 & 75 & 25 & 98 & 36 & 78\end{array}$ Rs. ( $x$ )

Sales in Lakhs Rs. (y) $\quad 47 \quad 53$

